A Business Plan for Sustainable Modular Homes

MESM Group Project Proposal, Class of 2008

The Donald Bren School of Environmental Science and Management
University of California, Santa Barbara

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ABSTRACT

This project is being carried out as collaboration between four Masters students at the Donald Bren School and the architecture and design firm of workshop/apd (the Client). The Client is interested in starting a new business venture whose purpose is to design, build and sell affordable sustainable modular homes. Ideally these homes will be price competitive with regular modular homes, while offering the value-added benefits of high design and sustainable materials and methods. Our new business will allow customers in the large middle-income bracket the opportunity to obtain a level of design and sustainability that is currently unavailable.

We will supplement our environmental science and management curriculum with classes in the Technology Management Program at UCSB, which focus on issues relevant to the creation of new ventures. We will perform a rigorous background review and market analysis in order to augment the creation of a coherent business plan. This research will also serve in the determination of the location and marketing strategy of the new business. We have already completed a preliminary feasibility study, which has informed us that there is a growing market demand for our product, and that there are no technological barriers to its creation.

SIGNIFICANCE OF PROJECT

The growing desire to limit the negative impacts of housing on the environment and human health has made for a rich opportunity to improve design, cost and healthy living conditions by offering sustainable modular homes. The main advantage of modular construction is the efficiency of mass production. In addition, markets for new materials from recycled content or substitutes for elements such as carpets, paints and sealants, are growing. Furthermore, new technologies emerging for wind energy, solar energy, and other cost-saving, energy-reducing tools, serve to create a fortuitous situation for an entrepreneur in the green building industry.

The growing awareness of global climate change will also increase future incentives for consumers and industry to find ways to reduce their carbon footprints. Sustainable modular housing will meet customer demand by offering features such as energy efficiency, water efficiency, waste reduction, material substitution, and green roofing at an affordable price. This timely product will allow customers to address sustainable living through the purchase and inhabiting of a sustainable modular home.

Our main objective is to write a coherent business plan that will result in the creation of a new business. This new business will be partnered with the architecture and design firm, workshop/apd, from which the original idea for the project was proposed. The questions that need to be answered are broad, ranging from the geographic location of the new company to the particular green features that will be offered.

BACKGROUND INFO

Introduction

This project was born out of an international competition hosted by Global Green to advance the sustainable rebuilding of New Orleans post Hurricane Katrina. Our project sponsor, workshop/apd, won the competition with a project titled “GREEN.O.LA: Permaculture and the Rebuilding of Life and Verdancy in Holy Cross.” With their first foray into sustainable design being such a huge success, workshop/apd has solicited the help of the Donald Bren School of Environmental Science and Management in conjunction with the UCSB school of Engineering Technology Management Program to research the market feasibility of their winning designs to the greater public.
workshop/apd was founded in 1999 as a design firm with offices in New York City and Nantucket, Massachusetts. Founding partners Andrew Kotchen and Matthew Berman have found success by synthesizing the often problematic restraints of context with a modern and progressive understanding of contemporary living. Both partners bring a diverse range of experience to the practice including rigorous design acumen, strong business sensibilities, comprehensive familiarity with construction, and sensible intuition.

Housing and the Environment
The construction and use of buildings is responsible for a great portion of raw material use, energy consumption, and indoor and outdoor pollution. The 2002 U.S. Green Building Council (USGBC) report, National Trends in Green Building, asserts that the construction and operation of U.S. residential and commercial building accounts for the consumption of 37% of energy, 68% of electricity, 40% of raw materials, and 12% of freshwater, while producing 36% of emitted CO2, 33% of the solid waste stream, 46% of sulfur dioxide emissions, and 19% NOx emissions.

Another issue of concern with building use is that of indoor air quality. Certain building materials, such as carpets and cabinets can off-gas which can trigger or exacerbate respiratory ailments such as asthma. Brian Gitt, CEO and Executive Director of Building Green, stated at the 2007 Alt Build Expo that formaldehyde in kitchen cabinets, off-gassing from carpets and other materials harmfully impact in-door air quality to the point to where indoor air quality is 2-5 times worse than outdoor air quality.

Green Architecture
The detrimental environmental impacts mentioned previously, and the increasing cost of energy has created a business opportunity to improve upon construction practices and material use. This heightened awareness of energy costs highlights green buildings’ increased resource efficiency and lower lifecycle costs. Traditional “green” features such as alternative materials, landscaping, and construction processes result in improved indoor air quality, and improved energy, water and resource efficiency. According to a representative sample survey conducted by the National Association of Home Builders (NAHB) SmartMarket Report on Green Building, “30% of home builders reported a more than moderate involvement in green building” (NAHB). However, the same report claims only 2% of new homes built in 2005 were “green” by traditional standards (LEED and Energy Star). This accounts for a marketplace of $7.4 billion. These numbers are expected to grow to $19-38 billion by 2010.

Green Standards
Green architecture, also known as eco-tecture, is a growing trend, but its increasing popularity begs the question: how green is green? The two most common green building standards are Leadership in Energy and Environmental Design (LEED) and Energy Star. LEED is considered the benchmark for green building practices and works by awarding different levels of certification based on a point system. The program, created by the United States Green Building Council (USGBC), takes an all-encompassing view of building and the environment, allotting points towards energy and water efficient design, construction, material use, and landscaping. Within the LEED rating system are

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various rubrics for different types of construction, which were recently expanded to include its pilot run for LEED for Homes. ²

The Energy Star program is a collaboration between the U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE). This program focuses primarily on energy efficiency through the promotion of endorsed products, appliances, and construction practices. To be awarded Energy Star approval a home must be “at least 15 percent more energy efficient than (traditionally built) homes.” ³

Modular Building and Market

There exist two basic housing types, differentiated by construction method: traditional stick-built and non-traditional. Non-traditional construction can be subdivided further into manufactured, panelized and modular construction. The focus of this project is on modular construction which consists of building modules, both the structure and the interior, within a factory and then transporting the modules to the site where they are assembled on a pre-installed foundation. Modular homes are generally characterized by their quick construction, high quality, cost effectiveness, and resource efficiency (National Modular Housing Council, NMHC). Additionally, the highly-controlled factory environment report fewer injuries and thus decrease workforce liability.

With manufactured construction, the entire building is completely constructed and assembled in the factory and permanently mounted to a wheeled chassis. Panelized construction is a series of prefabricated parts put together on-site such as roof, floor, and wall panel. This requires on-site contractors and subcontractors. This results in more assembly required onsite, but does not have the size restrictions associated with modular construction.

According to the United States Census, modular housing comprises roughly 3% of starts (new construction projects) in the housing market. Most are found outside of major metropolitan areas and are most common in the Northeast and Midwest. According to Avi Friedman, professor of architecture at McGill University, the modular figure is between 5-10% in North America and will jump to more than 35% in the next 10 years. Based on the growing trend of environmentalism in mainstream American culture, we expect that the demand for sustainable housing will grow, as well.⁴,⁵

Competitors

By its very nature, modular building is more sustainable than stick-built construction. However, incorporating green materials, energy efficient design and technologies into modular housing has created a new type of housing known as sustainable modular housing. As the green building sector and the modular sector grows, an increasing number of firms are capitalizing on this new niche market. The firms in this sector vary widely in their offerings from green features to price points to

⁵ Some Assembly Required – Prefabricated Homes: http://www.wired.com/wired/archive/14.01/prefab.html
regions. The following map illustrates points of shipment of various modular builders who offer some level of green features in their products.

**Figure 1**: Locations of competitors in sustainable modular building.

Sustainable modular building is most common in the West and Northeast. The few sustainable modular providers on the West Coast provide the bulk of homes we have found. Overall, the most notable sustainable modular architects and builders are MKD in Seattle, Marmol Radziner Pref-Fab in Los Angeles and Resolution: 4 Architecture in New York City. These companies specialize in high design, high-cost, sustainable modular homes. From the pricing information we obtained from MKD and Marmol Radziner we estimate their homes to cost around $250/ft², which do not include the cost of transportation and on-site specification work. Other competitors occupy highly specialized design and regional niches, and offer varying degree of green features. The costs of transportation generally limit geographical area that any one manufacturer can cover. None of these firms offer the business model that we are proposing, which is to bring stylish designs and green features into the affordable modular segment of the housing market.

**APPROACH**

We will attempt to complete each of the objectives by following these general steps:

1. Literature review
2. Gain knowledge related to starting new ventures
3. Determine business model
4. Determine target product
5. Determine target market segment
6. Develop a thorough business plan

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6 Michele Kaufman Designs: [www.mkd-arc.com](http://www.mkd-arc.com)

1. Literature review
As this project is of a different academic nature than other projects at the Bren School, we will be relying less on purely academic sources of information, such as peer-reviewed journals. Direct information about the product and the general concept of the business will be gained through communications with the Client. Background information about the particular industry will be found by studying competing firms and services, trade journals, interviews with experts and by attending seminars and exhibitions. We will also conduct interviews with industry experts, customers and competitors.

2. Gain knowledge related to starting new ventures
The skills and knowledge for the completion of this project will come not only from classes at the Bren School, but also from classes taken through the Technology Management Program (TMP). There are five classes in this latter program which all group members will complete: New Venture Creation, Business Planning for New Ventures, Managing Innovation, Entrepreneurial Marketing and New Venture Finance. It is through the completion of these courses that we will gain the skills and knowledge that relate directly to the evaluation of the business opportunity and the formation of the business plan. The particular objectives of this project will be addressed either directly or indirectly through assignments within these classes.

3. Determine business model
The main question to be answered in this step is that of how this product will ultimately be built and sold to customers. Are we a manufacturing company that will build the designs of workshop/apd and sell them directly to customers, or perhaps through a realtor or developer? Or, are we somewhere in between, perhaps creating a partnership with a manufacturer that goes beyond simply licensing our designs? What level of environmental performance will be offered in our products?

This will be determined through examination of the competition, communication with the Client as to their desires, and interviews with experts in business and our particular industry. The chosen business model will then form the basis for all other decisions related to the business plan.

4. Determine target product
Within the realm of sustainable modular housing, there are multiple product and design options for the project to pursue. The main options identified by the Client are single-family homes and mixed-use developments. Through the use of expert interviews, customer interviews, market analysis and existing market data we will evaluate each option and choose the best course for the initial launch of the new venture. This will include examining customers’ willingness to pay for the added benefit of different green features. The chosen option will be the focus of the business plan, with the possibility of future expansion into other design options.

In addition to this overall building scheme, we will evaluate the current standards and methodologies for “green” and “sustainable” housing, identifying those that are both cost-effective and scientifically credible for use in our products. This may include the adoption of one or more third-party certifications (e.g. LEED for Homes, Energy Star, Green Point, NC Healthy Built Homes).

5. Determine target market segment
We will first work to determine the geographic focus of the new company. This will be ascertained by first examining the locations of competitors, and then by market analysis of target areas without competition and/or with continued demand. Within the geographic area, we will then determine the
particular market segment to be targeted, using tools of market analysis. This will inform the marketing of the product, as well as the price that is charged. We will work to clarify the demographics and psychographics of our target customer. One method to be used will be the creation of a map containing layers of demographic and psychographic data, allowing us to identify geographic “hotspots” on which to focus.

6. Form comprehensive business plan
The initial steps to creation of the business plan will be, and have been, carried out in the courses through TMP. In the winter of 2007, we completed a general feasibility study of the idea. At the end of the spring of 2007 we will have completed the executive summary and a rough draft of the business plan. It should be noted that, since many of the questions outlined above will take more time to answer, these initial sub-projects contain assumptions that are likely to be changed in the final draft of the business plan.

By the end of the fall of 2007, we will have completed the necessary research to edit and update the draft business plan into a final document.

<table>
<thead>
<tr>
<th>OBJECTIVES: PROPOSED BUSINESS PLAN OUTLINE</th>
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<tbody>
<tr>
<td>A business plan is a vehicle to communicate a clear vision to investors about why manufacturing and selling affordable, sustainable modular homes is a great opportunity for our company. This message is conveyed in 8-10 pages which explain our solution to this market need, include a layout of the team that will execute the opportunity, and predict the key milestones of value creation. The objective is to make the investor comfortable with our solution and the credibility of the plan, and to exhibit evidence of customers’ compelling reasons to buy. We will meet these objectives by researching the questions laid out below.</td>
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**Team**
The people that comprise the initial team are of great importance and interest to potential investors. This section will highlight the relevant experience of the founders and management team. It will also include information about current or future partnerships, a credible board of directors, external advisors and potential key hires.

- What will be the structure of the company?
- What are the positions and responsibilities of the founding members?
- What is their relevant experience?
- Will there be partnerships? If so, with whom?
- Who will comprise the Board of Directors and/or external advisors?
- Who are potential key hires?

**Opportunity**
This section will define the problem that affordable, sustainable modular housing will remedy and measure the size of the opportunity. We will discover our value proposition by learning how big the problem is, whether the market is ready or willing to change, and estimate the size of the opportunity. Opportunity is measured based on the impact of solving the problem for our customer segment; thus, validating the opportunity. Past examples of market growth augment this section.

- What is the customer need that we are addressing?
- How does our product meet this need?
• What is our Minimum Viable Product?
• Why will we succeed?
• What is the current and expected size of a modular vs. stick-built single family home?
• How long does it take to build a modular vs. stick-built single family home?
• How much waste is generated (and how much is recycled) from a modular vs. stick-built single family home?
• How much fuel is used from the construction of a modular vs. stick-built single family home?
• What is the environmental impact of a modular vs. stick-built home? (incl. pollution, energy use, water use…)
• What are the health effects of modular vs. stick-built homes?
• How can we change the impact of modular home by following “green” standards?
• Are there any regulations specific to modular homes or “green” homes?

Market Research and Analysis (include sales projections)
• What is the current market share of the modular housing industry?
• What are the significant barriers to entry?
• What is the geographic coverage of current modular facilities?
• Where is the most growth expected?
• What design options are available to the average home buyer?
• What are their design benefits/drawbacks?
• What is the economic profile of the average home buyer?
• What is the cost to build and maintain a home in different regions?
• What are potential areas of risk both external and internal?
• Are there potential tax credits and rebates involved with our product?

Marketing Plan (explain sales projections)
• What is the cost to design and build a modular vs. stick-built home?
• What are the savings to be gained from modular building?
• What are the savings to be gained from green building?
• What are the financing options available to customers, and how do they vary for modular vs. stick-built homes?
• Does government money exist to supplement costs or are there grants to fund research?
• How long does it take for savings from the use phase to compensate for possible increases in the up-front cost of sustainable modular homes?
• What is the cost (time and money) to educate the consumer about the product?
• What is the role of PR in our plan?
• How will we determine the price?
• How will the product be marketed (branding, positioning and segmentation)?
• What are current market trends?
• What might be possible sales channels?

Competition
• How many direct competitors are there, who are they, and where are they located?
• How are we different from our competitors?
Manufacturing and Operations
- Who are the manufacturers and suppliers that have worked with workshop/apd on their previous modular housing projects?
- Should we leverage existing relationships into future partnerships (manufacturing, transportation, financing)?

Financial
- What are the expected expenses, cost of goods sold, revenues, etc.?
- What are the initial funding requirements?
- What is the minimum amount of money required to achieve our milestones?

Business Risks
- What are legal issues involved with this venture?
- Are there unique building regulations for modular structures?
- How variable are building standards among states, districts or municipalities?

Appendices
- The data and background research compiled by the Group Project will be included as supplemental materials to the business plan.

Execution - Milestone Planning
Milestones explain the necessary key events needed to meet objectives and keep on a path of value creation. Events determine milestones, not dates. The plan is broken down by time series and references back to the financial plan which supports the amount of money required at each step. This allows the plan to build on previously gained knowledge and to plan for the lowest cost required to get to the next important stage of business plan execution. The following is a generic example from the Harvard Business Review:8
  Milestone 1- Completion of Concept and Product Testing
  Milestone 2- Completion of Prototype
  Milestone 3- First Financing
  Milestone 4- Completion of Initial Pilot Tests
  Milestone 5- Market Testing
  Milestone 6- Production Start-up
  Milestone 7- Bellwether Sale- First substantial sale to expected major account
  Milestone 8- First Competitive Action
  Milestone 9- First Redesign or Redirection
  Milestone 10- First Significant Price Change

MANAGEMENT PLAN
We have defined and assigned the following roles:

Project Manager – the project manager will oversee the entire project, keeping a broad view on what has been done, is being done, and needs to be accomplished. The project manager will also run the meetings. Ideally, the manager at the beginning of each meeting will review what needs to accomplished during that meeting and keep the group on task, moving forward, working efficiently.

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Especially important at the beginning of the project, the project manager will develop and keep a timeline of tasks and deadlines. The manager will designate tasks and monitor progress. The manager may often act as a group facilitator and will have the final word when a decision needs to be made. The group and the manager will recognize that the assigned work allotment should account for the aforementioned duties. **Max DuBuisson** will be the project manager for the spring quarter.

**Project Manager Rotation:**

In an effort to give everybody who desires the experience as project manager, the manager will rotate amongst group members by quarter. Prior to the beginning of each quarter, the group will make the final decision on who will be the next project manager is, although we have the following guidelines:

- Spring 2007 – Max will be the project manager
- Summer 2007 – Kelly will oversee the project during the internship in NY
- Fall 2008 – TBD
- Winter 2008 – We may have 2 projects managers: one focusing on the final presentation, one focusing on the final report.

**Scheduling** – The scheduler will be in charge of setting meetings as required, checking meeting member’s availability and coordinating rooms. This person will also be the main point of contact with the faculty advisor, Matt Kotchen. The scheduler is **Nicole DeJonghe**.

**Financial** – The group member focused on finances will gain an understanding of the financial specifics assigned to our group projects. This person will keep record of finances and brief other group members on financial procedures and current standings. **Kelly Schmandt** will be our financial manager.

**Web and Data** – This person will be in charge of building and maintaining a web site for our group project. This roll will also involve managing the data and documents that are involved with the group project, keeping everything organized, labeled, and located correctly. **Max DuBuisson** will fulfill this role.

**Liaison** – The liaison serves as a point of contact with our Client, workshop/apd. This is in an effort to keep communication clear and consistent with our Client. The liaison will coordinate assessing availability of the Client in regards to scheduling appointments that involve workshop/apd. Our liaison is **Jamie Britto**.

<table>
<thead>
<tr>
<th>DELIVERABLES</th>
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| - Project proposal  
  - The project proposal is to be completed by the middle of May, and will include all of the sections as laid out in the group project guidelines.  
  - The proposal will be reviewed by outside reviewers no later than June 1\(^{st}\). The report from this review is due to the advisor by June 8\(^{th}\).  |
| - Website  
  - The project website should be created and updated by June 1\(^{st}\).  |
| - Draft business plan |
• We are working concurrently in ENGR 285C to create a draft of the business plan. This is due by the end of the spring quarter. It will be completed in sections over the course of the term, beginning with the Executive Summary.
• This business plan will be shared with the Clients for review and comment.

• Progress report
  • We will complete a report on the progress of the project to be turned in to the advisor by November 30th, 2007.

• Final report
  • The final draft of the report is due to the advisor by February 11th, 2008. This should be a close-to-finished product, preceded by multiple drafts.
  • It will contain all of the sections as laid out in the group project guidelines.
  • This report will serve as an addendum to the Business Plan.
  • The report will be submitted as a PDF file and in hard copy to Corlei Prieto.

• Final business plan
  • The final business plan will be completed along with the final report.
  • This will be submitted to the Client, as well as the TMP New Venture Competition.

• New Venture Competition 2008
  • A summary of the venture is due in early March. There is a first round of cuts based on one-page summaries. The final business plan for semi-finalists is due in mid to late April, 2008.

• Project brief
  • A 4-page summary of the final report will be completed and turned in by March 17th, 2008 (PDF format).

• Oral presentation
  • We will present their project for public viewing on April 2nd, 2008.

• Poster
**POINTS OF CONTACT**

**Project Members**
- Jamie Britto  
  jbritto@bren.ucsb.edu
- Nicole DeJonghe  
  ndejonghe@bren.ucsb.edu
- Max DuBuisson  
  mdubuisson@bren.ucsb.edu
- Kelly Schmandt  
  kschmandt@bren.ucsb.edu

**Faculty Advisor**
- Matt Kotchen  
  kotchen@bren.ucsb.edu

**Client, workshop/apd**
- Matthew Berman  
  mdb@workshopapd.com
- Andrew Kotchen  
  adk@workshopapd.com

**External Advisors**
- Dennis Allen, President, Allen Associates  
  dallen@dallenassoc.com
- John Greathouse  
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- Magali Delmas  
  delmas@bren.ucsb.edu
- Gary Libecap  
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**Other**
- Project Email  
  modular@bren.ucsb.edu
- Project Website  
  www.bren.ucsb.edu/~modular

**BUDGET**

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<tr>
<th>Description</th>
<th>Cost ($)</th>
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<tr>
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<tr>
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<tr>
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<td>Copies</td>
<td>100</td>
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<tr>
<td>Final Poster Production</td>
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</table>
**Final Brief Printing**  
Travel Expenses:  
*Food and gas*  178  
Meeting Expenses: *Snacks*  40  
Other  394  
**Total Fees**  906  
**Bren Contribution (printing and general expenses)**  1300

### Budget Justification

**Phone calls:** $58  
- Conference calls are necessary to maintain communication with the Client who is located in New York City. Calls will take place for approximately one hour every three weeks during the school year. The estimate includes setup, monthly fee, and conference call approximation.

**Printing:** $610  
- This includes the allotment for additional printing needs ($200), and average estimate cost of final brief ($170) and poster printing and production ($240). The brief and poster are required deliverables of the Group Project.

**Travel:** $198  
- Half-day trip to the Museum of Contemporary Art in Los Angeles of modular green building exhibit. Trip includes estimates for gas, food and admission.

**Meeting Expenses:** $40  
- Snacks and coffee for meeting with our Client.

**Other:** $394